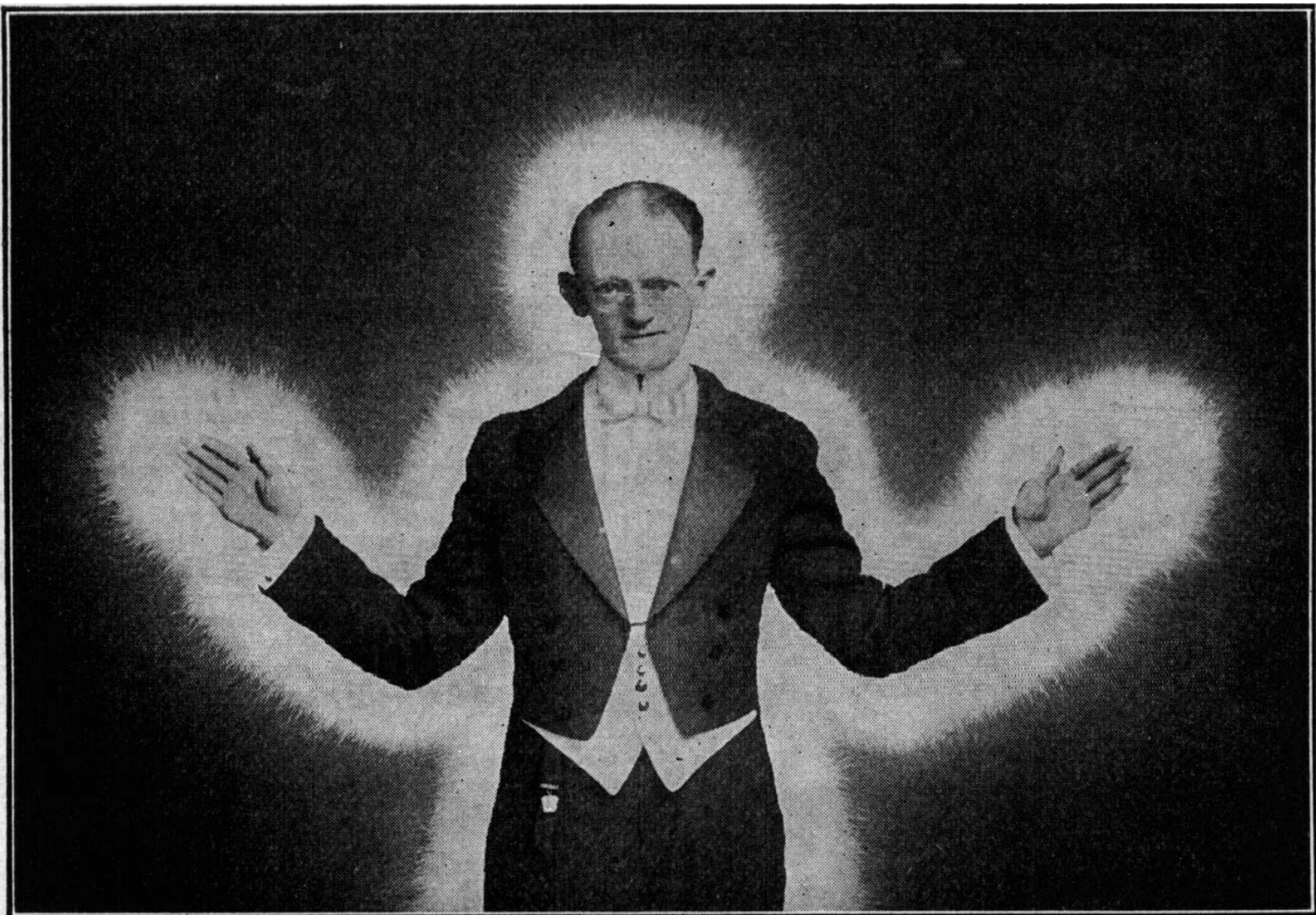


**This Photo Shows Dr. and Mrs. Strong with the Elaborate Apparatus Used in Lecturing in Different Cities. Note the Large Conical Oudin Coils in Full Activity.**



**Demonstrating in a Startling Manner, the Appearance of the Human (the Author's) Body When Charged With a High Frequency Current. This Picture Shows Exactly How a Person Charged From a Powerful High Frequency Apparatus Would Appear to Our Unaided Eyes, Were They Attuned to Respond to Vibrations of One or Two Millions Per Second, Instead of From 380 to 760 Million-Millions Per Second (the Range of Normal Human Vision). This Display Greatly Resembles the Natural Aura Surrounding the Human Body, but which Average Persons Can See Only by Gazing Thru Special Chemical Screens.**



## Electricity and Life

By FREDERICK FINCH STRONG, M.D.

Lecturer on Electro-therapeutics, Tufts Medical School, Boston

**S**CIENTIFIC progress during the past three decades has perhaps surpassed that of all preceding ages; but we are still in the kindergarten class when we compare what is known with that which is still to be discovered.

To discover means practically the same as to uncover, implying that the truth or fact was there all the time but was hidden, covered, occluded, or occult; and is it not a fact that many of the electrical discoveries of to-day would have been regarded as supernatural or occult by the scientists of a few generations ago? Of course there is nothing supernatural in the strict sense of the term, but many things remain occult, altho science is daily uncovering new and hitherto undreamed-of marvels.

There exist great Cosmic Forces of which we still know but little. Gravitation is one of these; we know something of its laws and the results of its action, but nothing whatever of its real nature. Electricity is another; of this we know somewhat more, and we now recognize it in a variety of forms, as light, heat, chemical action, magnetism, etc., but its true nature is still a deep mystery. Life-force or vital energy is another great Cosmic Principle; thru its action electrons are formed into atoms, atoms into molecules, molecules into crystals and chemical compounds, and these into the bodies of plants, animals and of

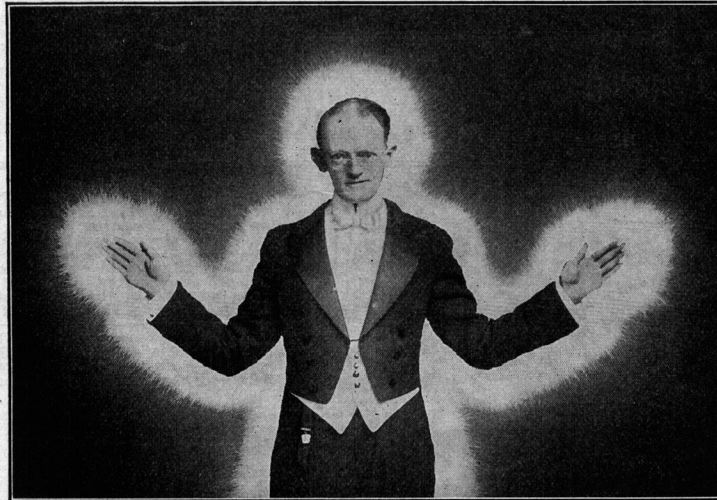
nized this force; it is quite unorthodox to even suggest that it exists—simply because we have not been able to measure and record it by our still comparatively crude laboratory instruments.

A few years ago, when almost every sci-

and frequency during some research work. He prophesied that when electrical oscillations were fully understood and applied by physicians that a universal healing agent would have been obtained—one which would so increase the vital energy and re-

sistive reaction of the human body as to enable it to throw off all disease. The present writer, acting on this hint, constructed a high-frequency apparatus, tested it on a number of patients and reported his results to a local medical society in 1895. So far as can be learned this was the first clinical work ever done with the Tesla Current, altho d'Arsonval in Paris was then experimenting with his relatively low voltage currents, produced from 3,000 cycle alternators. Later, Apostoli, Denoyes, and others reported remarkable results from the currents induced in the bodies of patients placed inside of huge solenoids or wire coils thru which high frequency currents were passing. The effects obtained were: increase of strength, appetite and weight, induction of natural restful sleep, and increase in tissue combustion and elimination.

Early in 1895 the author devised the first Vacuum electrodes for applying Tesla currents to the patient. To-day thousands of physicians are using this device, often miscalling it the Violet-ray Treatment. This is of course a misnomer, the violet light in the tube having nothing whatever to do with the healing effect pro-

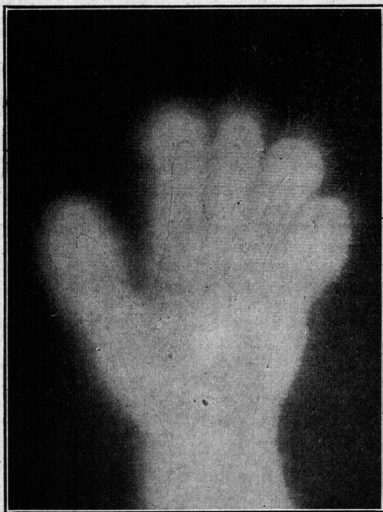


Demonstrating in a Startling Manner, the Appearance of the Human (the Author's) Body When Charged With a High Frequency Current. This Picture Shows Exactly How a Person Charged From a Powerful High Frequency Apparatus Would Appear to Our Unaided Eyes, Were They Attuned to Respond to Vibrations of One or Two Millions Per Second, Instead of From 380 to 760 Million-Millions Per Second (the Range of Normal Human Vision). This Display Greatly Resembles the Natural Aura Surrounding the Human Body, but which Average Persons Can See Only by Gazing Thru Special Chemical Screens.

entist was a materialist, we believed in nothing but matter and force; to-day science recognizes the necessity of a third basic principle, Intelligence or Mind; without this we can satisfactorily account for none of the facts of the world in which we find ourselves. Its manifestations in matter thru the Cosmic Forces give us at least a working hypothesis of life.

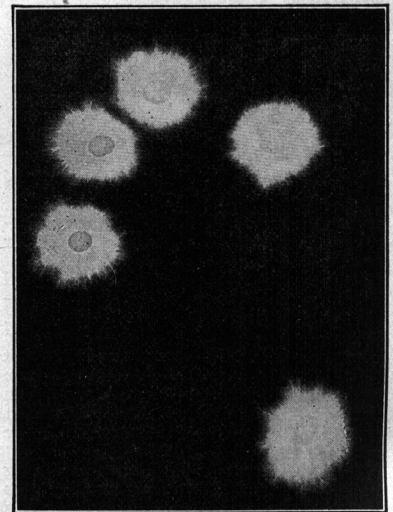
As electricity has been the great field for the investigations of the past century so will the nature and manifestation of the Life-force be the source of the discoveries of the future. Even to-day we may hazard a few statements regarding this hypothetical Prana or Vital-force. For example, it comes to us—like all other active forces—from the Sun. It is stored and transmitted by plants and by the oxygen of the air, and in the human body it appears to be distributed thru the great Sympathetic Nervous System to every organ and tissue of the body. The Sympathetic nerves radiate from the Solar Plexus—our Sun-center. If bacteria or poisons interfere with this circulation, as for example in infantile paralysis, the muscles from which the supply of life force is cut off, lose their power of reaction and wither away. It is in this connection that we may study the action of certain electric currents as applied to the treatment of disease. It would seem that certain types of alternating currents of high frequency and voltage greatly facilitate the distribution of this vital principle (Nerve-force, Prana, or whatever you choose to call it), and this explains the action of one of the most valuable of recent medical discoveries.

In 1893, Dr. Nikola Tesla described in a magazine article the remarkable effects upon himself and his assistants resulting from their exposure to the action of alternating currents of exceedingly high-voltage



Electrical Autograph of the Human Hand, Showing the Radiations from it When Charged with a Powerful High Frequency Current.

man. We have no name for this force, but thru its action the great Cosmic Scheme of Evolution goes on. In India they call it by a Sanscrit name—Prana. Here in the Occident we have not yet officially recog-



A Striking Electrical Autograph of the Tips of the Four Fingers and Thumb of the Author's Left Hand. A High Frequency Current Charged the Hand while It Rested on a Photograph Plate, With the Results Shown.

duced by the transmitted electrical oscillations.

(Continued on page 831)

**ELECTRICITY AND LIFE.***(Continued from page 798)*

Some years ago the great Swedish scientist, Arrhenius, was reported to have subjected one-half of a class of school children to the action of high-frequency currents, one hour daily for several months, at the end of which time there was marked increase in the average growth, weight, general health and mental ability in the electrified pupils as compared with those not so treated. At the present time high-frequency currents are actually being used in truck-gardens to promote the growth and increase the size of vegetables for table use.

The high-frequency currents, in short, act as *vitality boosters*—no other form of electricity will do this. *Galvanism, Faradism, Static* electricity are all valuable agents in the hands of the Electro-therapeutic specialist, but they have little direct action in promoting cell vitality and growth, as do the high-frequency currents when properly applied.

Authorities explain the action of high-frequency currents in various ways, the favorite theory being that the healing effect is due solely to the liberation of heat in the tissues. It is perfectly true that in many diseases the heat liberated in the body by the passage of from 400 to 2,500 milliamperes at a frequency of about one million cycles is an important agent in promoting an artificial inflammatory reaction and increasing circulation. The heat is, however, only one of the *secondary* forces generated by the current; there are many other factors in the vitalizing effect. The thermic theory will, for example, not explain the increased growth of plants produced by the action of high-frequency currents of very high voltage and low amperage. In medical practise often the most marked results are obtained by the use of Tesla currents of low intensity, but of exceedingly high potentiality. The author can account for these effects only on the theory that these currents, when of proper frequency, are *synchronous with the normal rate of sympathetic nerve vibration*, and in this way increase the flow of the mysterious *Pranic* force thru which function and tissue growth are maintained.

High-frequency currents are now extensively used by the medical profession to increase cell growth, metabolism and functional activity. They tend to normalize the blood pressure and are the only agents that are of real curative value in certain stages of Arterio-sclerosis (hardening of the arteries). They greatly augment the defensive powers of the organism, enabling it to resist and overcome disease-producing agencies. The prejudice against high-frequency currents on the part of many physicians may be attributed to the fact that they do not employ proper technique or that they use an apparatus which does not admit of proper variation of frequency, amperage and voltage, in order to suit the requirements of the individual case.

In the next article the author will describe the details of construction of an apparatus suitable for the generation of high-frequency currents for therapeutic use and the technique for their application.

**AN ELECTRIC "MOVIE" MACHINE FOR THE HOME.***(Continued from page 795)*

The mother may catch on the film the first steps of the toddling baby; the boy can snap his mates at play; the family can have their birthday motion pictures of every member, not to mention the Thanksgiving and Christmas reunions.

The adoption of this instrument to the study of various subjects will be of immeasurable value, especially in geography, biology, chemistry and physics, which will

certainly be simplified by the use of this invention. The new device may be used with equal advantage for projecting visualized bulletins for public use. It is without doubt one of the greatest inventions in the motion picture field and will certainly solve many dubious problems.

**20,000 LEAGUES UNDER THE SEA.***(Continued from page 791)*

fore, it is also fitted with a torpedo, which is later actually discharged at one of Capt. Nemo's enemies.

Our second photograph illustrates the submarine's sea drop-door open, one of the sailors emerging under the water. The crew, when starting on its undersea journey, is equipped with the necessary diving apparatus, these being self-contained and employing no lines or pipes with which to supply fresh air. On the back of the sailors are strapped compressed air tanks and these are carried about without undue trouble. The divers' feet are covered with shoes having heavy leaden soles so as to increase the body weight, permitting the operator to walk on the bottom of the sea.

We see several wonderful actual scenes at the bottom of the ocean and one of our illustrations shows a photograph of the crew of the *Nautilus* walking on the sea bottom entirely free from any encumbering connections whatsoever. One of the sailors can be seen holding a sea turtle which he is carrying in his hand, clearly shown in our illustration.

Considerable difficulties are encountered in walking on the ocean bottom, due first to the tremendous water pressure and second to swift currents along various points. Many interesting underwater performances are given by Capt. Nemo and his crew; the scenes showing actual man-eating sharks and hunting them, is perhaps one of the most thrilling pictures ever made. There is no faking in these pictures and in one of them can be actually seen how one of the sharks makes a vicious slash at Capt. Nemo, only to be rebuffed with the butt of his rifle. Another fascinating scene is that showing a battle with an octopus with Capt. Nemo, but this scene was obviously staged with a dummy octopus. Another scientific feature shown, which, by the way, was predicted by Jules Verne, is the employment of compressed air guns which are quite necessary for the undersea hunts.

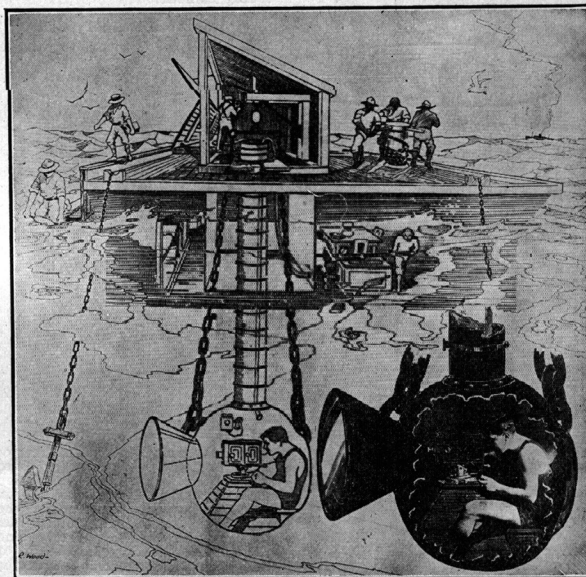
What the audience of course does not see is how these pictures were taken. It involved the use of wonderful electrical equipment in producing this most remarkable film. To begin with, a special camera had to be employed. This was enclosed in wide tubes fitted with powerful lenses at the lower end. Into this tube was placed a regular photographic motion picture camera as well as the person operating it. While many of the pictures were taken in actual sunlight (the sun shining directly thru the water and giving sufficient illumination, providing the depth was not too great), most pictures were taken at such a

depth that electrical illumination was necessary. This was accomplished by projecting powerful beams from electrical searchlights on the scenes to be filmed. The electrical energy supplying these monstrous electric arcs was fed thru heavy submarine cables and attached to dynamos driven by gasoline engines, supported on barges near the scene of this Twentieth Century Capt. Nemo's exploits.

As an educational film, "20,000 Leagues Under the Sea" probably rivals anything that has appeared heretofore.

It is a great pity that Jules Verne, who died some eight years ago, could not have lived to see this wonderful picture, which so well demonstrated his vast knowledge in all the various branches of science.

*Photos Courtesy of Universal Film Company*



Illustrating the Novel Manner in which Scenes for the "20,000 Leagues Under the Sea" Movie Spectacle Were Photographed by Placing the Camera and Operator (in Swimming Suit) Down in a Special Tube.

**FUR COAT "ELECTRICITY" BLOWS UP AUTO.**

Electricity induced by the friction of a fur coat worn by Surgeon Raymond Spear, U.S.N., grounded thru an automobile standing on wet ground and caused a spark which exploded the gasoline, burning Surgeon Spear severely and destroying the machine. The surgeon was able to leave the naval hospital here, but still is under treatment at his home.

Surgeon Spear had walked some distance to his garage in his fur coat and rubber boots. The friction of the flapping of the coat against his legs generated the electricity, while his boots insulated him from the ground and allowed his body to store it. A spark did the rest.

**CELEBRATING MR. EDISON'S BIRTHDAY.**

The employes and associates of Mr. Thomas A. Edison celebrated his seventieth birthday at a dinner held in the electric storage battery building, West Orange, N.J., at 6:30 p. m., Saturday, February 10. The event was informal and entirely social, and about 1,500 persons were present. Some of Mr. Edison's personal friends and former associates were invited. Mr. Edison's birthday is really on February 11, but on account of that day falling on Sunday, it was decided to hold the celebration on Saturday the tenth.



## How to Use High Frequency Currents in the Treatment of Disease

By Dr. FREDERICK FINCH STRONG.

Lecturer in Electrotherapeutics, Tufts Medical School, Boston

**N**OW that the exigencies of war have temporarily suspended the activities of amateur Radiotelegraphers, many of those possessing transmitting outfits are using them for the experimental study of the

be used by the amateur. It is made up as follows:—

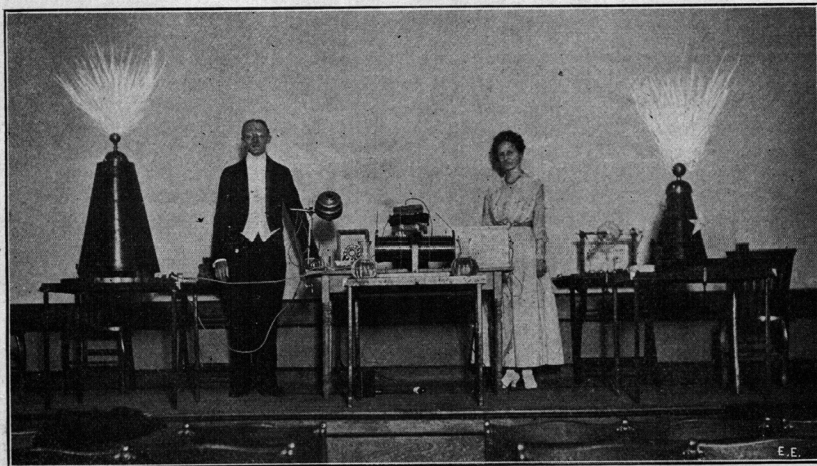
*Transformer*.—Any standard  $\frac{1}{4}$  K.W. radio transformer (E. I. Co., Clapp-Eastham, Thordarson, etc.)

*Condenser*.—Standard wireless glass plate

turns to the inch; 12" winding, 1" margin on each end). Slip the secondary into a 4" mailing tube, center accurately by means of three corks in each end, seal one end by standing coil on end in a shallow pan filled with melted resin, and when cold fill the annular space between tubes with a mixture of beeswax (yellow) one part, to resin, 5 parts. Wind primary, consisting of six turns "Magneto" cable (which can be bought for five cents a foot) around center of outer tube; turns spaced  $\frac{1}{2}$ " apart. Secondary leads, of magneto cable, should be connected to the outer posts of the writer's "triple terminals." One arrangement of the complete apparatus is shown in Fig. 2. The triple terminals greatly facilitate the therapeutic use of the Tesla Currents, and also afford an opportunity for studying different forms of the high-frequency discharge. The actual terminals, A and C, are formed of two moulded high-tension insulators, surmounted by 2" brass bed balls, (known to the furniture trade as "brass vases"); thru terminal A slides a brass rod having a rubber or hard-wood handle on the outer end, and a 3" flat brass disc on the inner end. Terminal C is similar but has a small brass ball on the inner end of the sliding rod. A "Dummy" terminal, B, is mounted as shown, midway between the actual terminals. By closing the gap between the brass discs and opening that between the balls B and C, an arc discharge is obtained, while by closing gap B C, and separating the disc electrodes, the discharge forms a beautiful purple brush or "effluve."

In giving treatments the patient is seated on a folding *condenser pad* of thin fibre of Bakelite, Fig. 4, backed with copper or tin foil to which is attached an insulated cord connected with terminal C. The operator will require a set of vacuum electrodes, Fig. 5, a metal hand electrode formed of an eight-inch length of  $\frac{1}{4}$ " nicked brass pipe, "effluve" electrode made from the gong of an old electric bell screwed on the end of a hard-wood handle, and two pieces of sheet block tin 3" x 3" x  $\frac{1}{32}$ " with insulated conducting cords soldered to their corners, Fig. 6. The condenser-pad can be obtained from any electro-therapeutical supply house, as also the vacuum electrodes and other materials.

For ordinary general treatment to promote nutrition, increase circulation and elimination—a treatment of value in almost any condition of impaired health—the balls and discs are widely separated and



This Photo Shows Dr. and Mrs. Strong with the Elaborate Apparatus Used in Lecturing in Different Cities. Note the Large Conical Oudin Coils in Full Activity.

phenomena of High Frequency currents. In the ELECTRICAL EXPERIMENTER for May, 1917, the writer described the construction of a Tesla D'Arsonval high-frequency outfit made from standard "Wireless" apparatus, consisting of a  $\frac{1}{4}$  or  $\frac{1}{2}$  K.W. transformer with glass plate condenser and oscillation transformer, the latter used as a series inductance to obtain various effects from the Tesla coil, or as a "D'Arsonval Solenoid" for obtaining the "Diathermic" and "Auto-condensation" currents so valuable in the treatment of certain diseases.

Many excellent results can be obtained from high-frequency treatment administered by those who have little or no knowledge of medicine. A physician's advice should always be obtained before undertaking the treatment of any serious case, but the amateur may safely employ moderate doses of Tesla currents, and even mild diathermy and autocondensation, provided he makes himself reasonably familiar with the elementary principles of electrotherapeutics.\*

In a few States there is a law prohibiting the therapeutic use of electricity by any but licensed physicians, but even this would not apply to treatments given gratuitously by amateurs to relatives or friends. A number of the writer's former pupils have become successful practising electrotherapeutists, altho they are not physicians. Most of them wisely refrain from the use of the sinusoidal, Galvanic and static currents; these belonging more to the field of the electro-medical specialist.

A simpler and cheaper apparatus than the one described in the May issue of this journal will give all the varieties of therapeutic high-frequency currents that may safely

condenser, one section of .005 microfarad; two sections of .01 m.f., each in series will be safer.

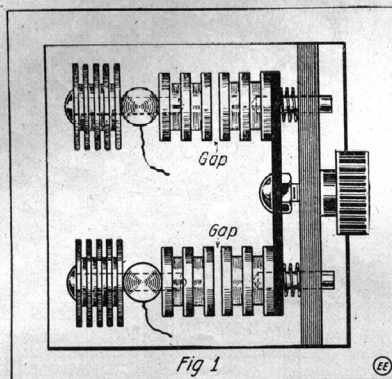


Fig. 1. A Simple Form of Fixed Spark Gap, Found Very Satisfactory for High Frequency Outfits.

*Inductance Coil*, ("D'Arsonval" solenoid), thirty turns No. 12 bare copper wire, wound around a wooden cage 8" in diameter,  $\frac{1}{4}$ " between turns.

*Spark gap*.—Adjustable series gap, made as shown in the diagram, Fig. 1. The sparking surfaces are of copper, turned in annular or concentric grooves as described in a previous article. Copper washers of  $\frac{1}{2}$ " and 1" diameter, are slipped alternately on an 8-32 machine screw, and form the heat radiating wings. The further construction and operation of the gap is indicated in the drawing.

*Tesla Coil*.—Identical in winding to that previously described, viz.,—secondary—on a 2" diameter paper mailing tube wind 480 turns of No. 34 S. C. C. magnet wire (40

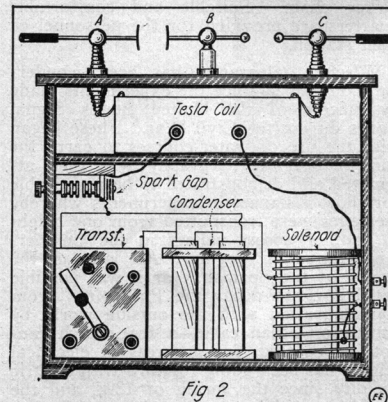


Fig. 2. Assembly of Apparatus in the Author's High Frequency Therapeutic Outfit.

\* The new edition of the writer's book, "Essentials of Modern Electrotherapeutics," now in press, gives all needed information, with an alphabetical list of various diseases and the method of treating them electrically.

the patient is seated on the condenser pad connected to the terminal C. Open the spark gap until a vacuum electrode lights up when held about a foot from the patient: this shows that the body is being charged inductively to a high potential, the charges alternating some 1,500,000 times per second. The patient feels nothing and is absolutely insulated from all electrical connection with the apparatus, yet hot sparks can be drawn from any part of the body showing that the whole organism is being subjected to a rapidly alternating molecular massage, which has the effect of increasing all the vital functions without acting as a stimulant. In other words the treatment tends to bring the patient into a normal condition, but it has no more effect upon a perfectly healthy person than pouring water into a pail already full. This is the reason why high frequency treatments may be safely given by those who are not physicians, whereas all other forms of therapeutic currents act as stimulants or counter-irritants and must be employed with precise knowledge and discrimination.

The condenser treatment as described above, is usually given for about fifteen minutes after which the bulb-shaped vacuum electrode is applied for a few minutes over the spine and solar-plexus. It is applied either directly to the surface of the body or thru one thickness of clothing. The insulating handle of the vacuum electrode is connected to the middle post B, in Fig. 2, and after turning on the current and placing the electrode on the patient, the discs A and B, are closed, being opened again before lifting the electrode from the surface of the body: if this is not done painful sparks will pass from the glass electrode to the patient. In treating obstinate cases of recurrent neuralgia, chronic rheumatism and partial paralysis, this vacuum sparking treatment is often beneficial, but it is rather unpleasant for most cases. A milder form of this counter-irritant effect is obtained by using the vacuum electrode over two or three thicknesses of clothing; it must be moved rapidly from place to place, otherwise the skin might be blistered.

For sedative effects and to reduce local inflammation and congestion, the vacuum electrode should always be applied directly

to the skin or mucous membrane; this applies to such conditions as acute rheumatism, neuritis, tonsillitis, etc., an acute "cold in the head" (coryza) can often be aborted

around the metal "pipe" electrode connected to the upper turn of the coil, the current is turned on and the spark-gap opened until a pleasing sensation of warmth is felt flow-

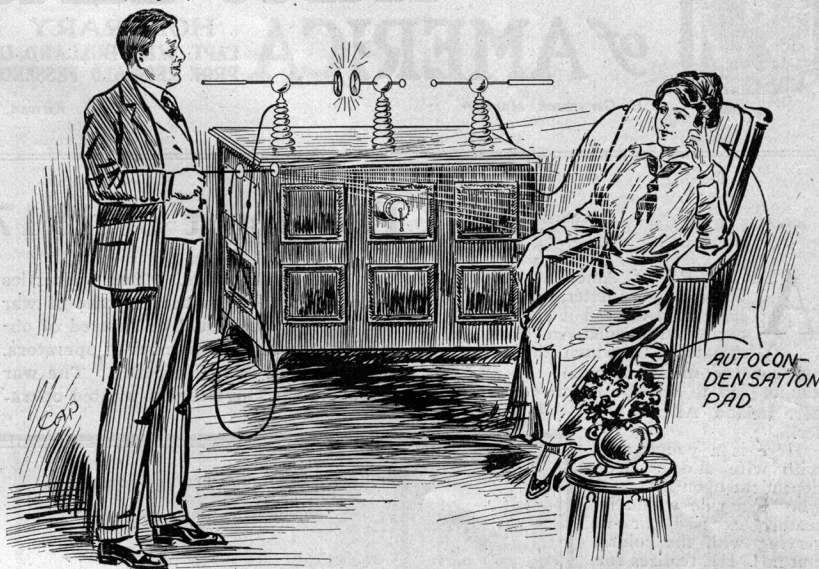
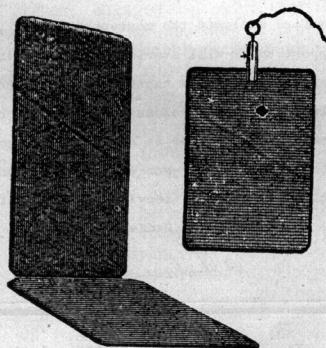


Fig. 3. Showing How a Patient Is Given the High Frequency "Effluve" or Spray Treatment. The Patient Sits on a Folding Condenser Pad Placed in the Chair.

in one treatment by the above technique, using the vacuum electrode over the nose



Figs. 4 and 6. Condenser Pad Used for Giving Auto-Condensation Treatment and Auxiliary Tin Electrode.

and the thin slender vacuum electrode in the nasal cavity.

In treating skin diseases, such as eczema and acne, where we wish to avail ourselves of the antiseptic and tonic effects of the "effluve," we connect the effluve electrode in place of the vacuum electrode, close the discs and gradually approach the bell of the electrode to the patient until a full, blue violet effluve plays upon the surface to be treated (see Fig. 3). To obtain the best effluve effects several turns of the tuning coil should be used in series with the Tesla primary (see article in May issue). The effluve is also valuable as a general tonic in sluggish conditions of the digestive system, also in nervous depression and functional nervous diseases.

For the relief of abnormal arterial tension—"high blood-pressure", and in the treatment of arteriosclerosis, as well as in conditions involving excess of uric acid, we employ "D'Arsonval autocondensation." To obtain this current we short-circuit the Tesla primary by means of the single-throw switch, and attach the condenser pad to the lowest turn of the "Solenoid" or tuning coil. The patient clasps both hands

ing up the patient's arms. In all regular therapeutic high-frequency outfits, a hot-wire milliamperemeter is placed between the patient and the machine. This is not necessary in connection with the above described apparatus, as it only delivers a maximum of 800 milli-amperes to the patient—an amount well within the limits of safety. In chronic cases autocondensation should be given daily in twenty-minute treatments. This treatment should never be given immediately after eating, or in cases of "Bright's Disease," or in organic heart trouble. High frequency treatments are of great value even in these conditions, but they should be applied only by a skilled specialist.

In inflammation following acute infection, as in acute bronchitis, incipient pneumonia, etc., we employ "local autocondensation" or "indirect Diathermy." In this method the patient sits upon the pad as for autocondensation, but instead of the metal handle we employ one of the plates of block tin; this is applied in close contact with the skin over the affected area, covered with a folded towel and held in place by the patient; a sensation of deep penetrating heat is felt, and relief from the pain and congestion follows. This is one of the most valuable methods in electrotherapeutics; were it available for the general practitioner, or better still, in the patient's home, there is no doubt but that nine-tenths of the cases of acute local infectious disease could be aborted. This is also of great value in the treatment of asthma.

Statistics show that one-seventh of all recorded deaths are due to Pulmonary Tuberculosis ("Consumption"); proper treatment in the home by high frequency currents would greatly increase the percentage of recoveries from this dread disease. Dr. Howard Van Rensselaer of the Albany Tuberculosis Hospital has reported 80% of cures by high frequency treatment, and an even higher percentage is reported by Dr. Alfred Geyser of New York. The writer feels that this subject is of sufficient importance to be treated in a separate article, which will appear in next month's ELECTRICAL EXPERIMENTER under the title "The Home Treatment of Tuberculosis with High-frequency Currents."

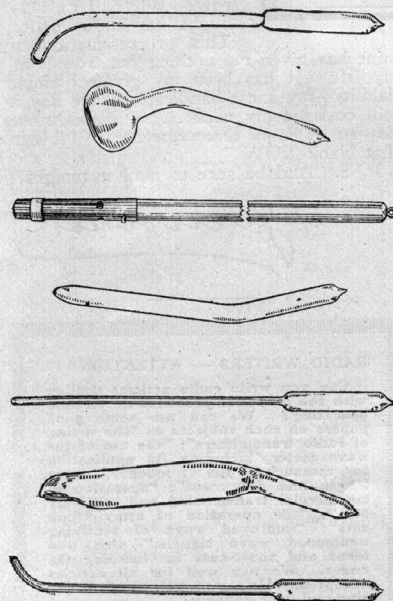


Fig. 5. Various Forms of High Frequency Treatment Electrodes. They Are Made of Glass.